

East African Medical Journal Vol: 94 No. 5 May 2017

INCISIVE PAPILLA AND POSITIONS OF MAXILLARY ANTERIOR TEETH AMONG KENYANS OF AFRICAN DESCENT

C.N. Ogada and R.J. Mutave

INCISIVE PAPILLA AND POSITIONS OF MAXILLARY ANTERIOR TEETH AMONG KENYANS OF AFRICAN DESCENT

C.N. Ogada and R.J. Mutave

ABSTRACT

Objective: To describe the relationship between the incisive papilla and the maxillary anterior teeth among Kenyans of African descent.

Design: Descriptive cross-sectional study conducted over six months.

Setting: The Department of Conservative and Prosthetic Dentistry, School of Dental Sciences, University of Nairobi.

Subjects: One hundred and twelve students of African descent studying at the College of Health Sciences, University of Nairobi, Kenya.

Results: One hundred and twelve maxillary casts generated from participants aged 18-35 years (mean age 22.39 ± 2.00 years), with well aligned arches were studied. The maxillary central incisor exhibited a mean of 14.93 ± 1.52 mm from the posterior limit of the incisive papilla while the inter-canine line scored a mean of 4.73 ± 1.73 mm anterior to the most posterior limit of the incisive papilla. The mean inter-canine width was 35.44 ± 1.79 mm.

Conclusion: This study brings out salient unique features in the relationship between the incisive papilla and maxillary anterior teeth among Kenyans of African descent, which may guide placement of maxillary central incisors and canines during complete denture construction.

INTRODUCTION

Alveolar resorption that follows loss of natural teeth makes it difficult to determine positions of prosthetic teeth during tooth replacement. The positions of prosthetic teeth are best determined using pre-extraction records such as casts^{1,2}. Most persons who seek Prosthetic replacement of maxillary anterior teeth may not have pre-extraction records. In such situations, biometric guides may aid in the determination of prosthetic tooth positions³. One of the most commonly used biometric guides in determining the positions of the maxillary central incisors and canines is the

incisive papilla. This is because it remains relatively stable after loss of maxillary anterior teeth and subsequent resorption of the maxillary ridge⁴. The relationship between the incisive papilla and the maxillary anterior teeth has thus been a subject of discussion in the prosthodontic literature for some time. Most studies on this relationship have been conducted among, mostly Caucasians. Differences in body structure between racial groups have been demonstrated. This study sought to describe the relationship between the posterior margin of the incisive papilla and the maxillary central incisors and canines among Kenyans of African descent.

MATERIALS AND METHODS

This study was approved by the Kenyatta National Hospital/University of Nairobi Ethics and Research Committee (Ref No KNH-ERC/A/108). Altman's monographs for calculation of sample size were used to determine the sample size. This study included 112 participants of African descent who were students at the College of health sciences, University of Nairobi. Maxillary impressions were recorded from all participants in Irreversible hydrocolloid (Blueprint® 20+, Dentsply Detrey GmbH, Konstanz Germany, batch no. 1207151573) using stock trays (GC Europe, Leuven, Belgium). The impressions were rinsed thoroughly under cold running water to remove any debris, disinfected by immersion in Zeta 7 solution (Zhermack® clinical, Badia Polesine, Italy) according to the manufacturer's instructions. The impressions were then wrapped in wet napkins and stored in zip-lock polythene bags to minimise dimensional changes. Type IV gypsum (Kaldent by Kalabhai, Mumbai, India, batch no. 121001) was used to pour the impressions within 15 minutes of impression taking under vibration to generate casts. The casts generated were trimmed using a model trimmer (Manfredi, Dentalcon Trading Ltd, Nicosia – Cyprus) under wet conditions, bench dried and stored in polythene bags in a dry environment. The casts were evaluated for details which included the tip of the canine, the most posterior point of the incisive papilla and the most labial aspect of the maxillary right central incisor which were identified on the casts and marked using a marker pen with a fine point (1.0mm tip diameter, Guangdong Baoke stationary co, LTD, Guangdong, China.). A photocopy of each cast (Figure 1) was made using a photocopier (Kyocera Corporation, Kyoto, Japan.) to generate an image of the occlusal surfaces of the teeth in one plane at a ratio of 1:1 (the occlusal plane was used as the

reference plane). The position of the casts on the photocopier was standardized by placing cellotape to form a square frame within which each cast was placed facing the same direction. Each cast was placed with the occlusal surface downwards, resting on the photocopier. On each photocopy, the tips of the canines were joined with a straight line (the inter-canine line). Lines parallel to the inter-canine line were drawn passing through the most posterior margin of the incisive papilla and the most labial aspect of the right maxillary central incisor. A perpendicular line joining these three lines was drawn to allow measurement of the distance between the lines. The same fine point pencil (Push 0.7, Pelikan, Schindellegi, Switzerland), which does not require sharpening, was used to draw all the lines for standardization on the thickness of the lines as depicted on the figure.

The following measurements were obtained from each photocopy using a digital caliper (CEN-TECH, Model 47256, Calabasas, CA) to the nearest 0.01 mm.

- the distance between the cusp tips of the canines (inter-canine width).
- the distance between the line joining the canine cusp tips and the tangent to the posterior margin of the incisive papilla.
- the distance from the posterior margin of the incisive papilla and the most labial aspect of the right maxillary central incisor.

All the measurements were repeated thrice on three separate occasions and the mean of the sum of the three taken as the correct measurement. Data were analysed using the statistical package for social sciences (SPSS) Version 17(SPSS Inc., Chicago IL).

RESULTS

The mean distance from the posterior margin of the incisive papilla to the most labial aspect of the right maxillary central incisor was 14.93±1.52mm. The mean distance from the posterior margin of the incisive papilla to the most labial aspect of the right maxillary

central incisor among the male participants was 15.00±1.56mm, while among the female participants it was 14.85±1.49mm. The distance did not vary with gender (p=0.61). The mean inter-canine width was 35.44±1.79mm. There was no association between age and the inter-canine width (Pearson Correlation 0.03, p=0.75) (Figure 2).

Figure 1
A sample of a photocopy of a cast

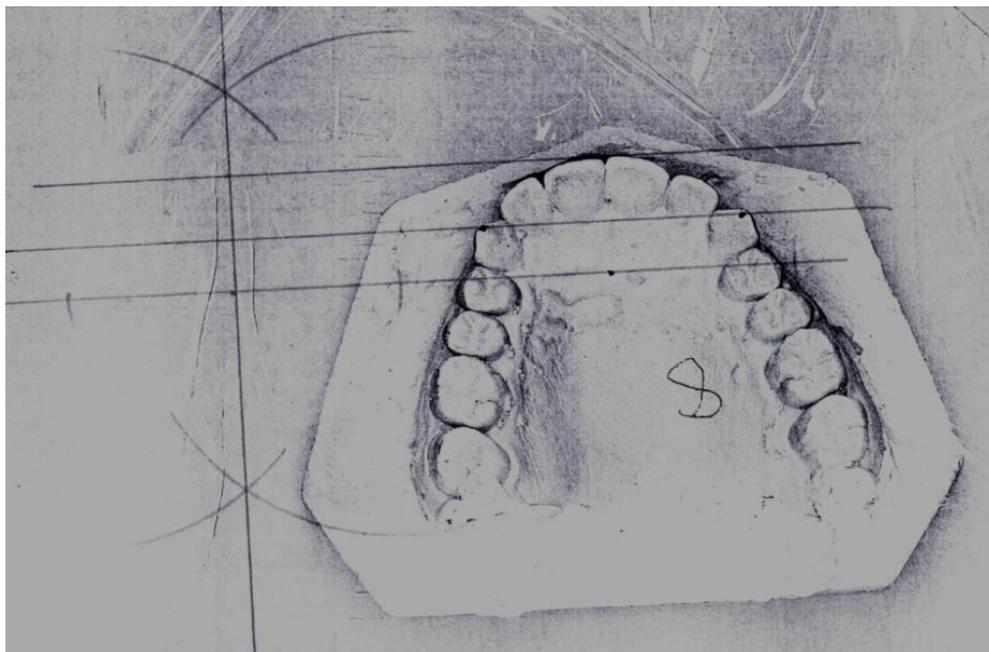
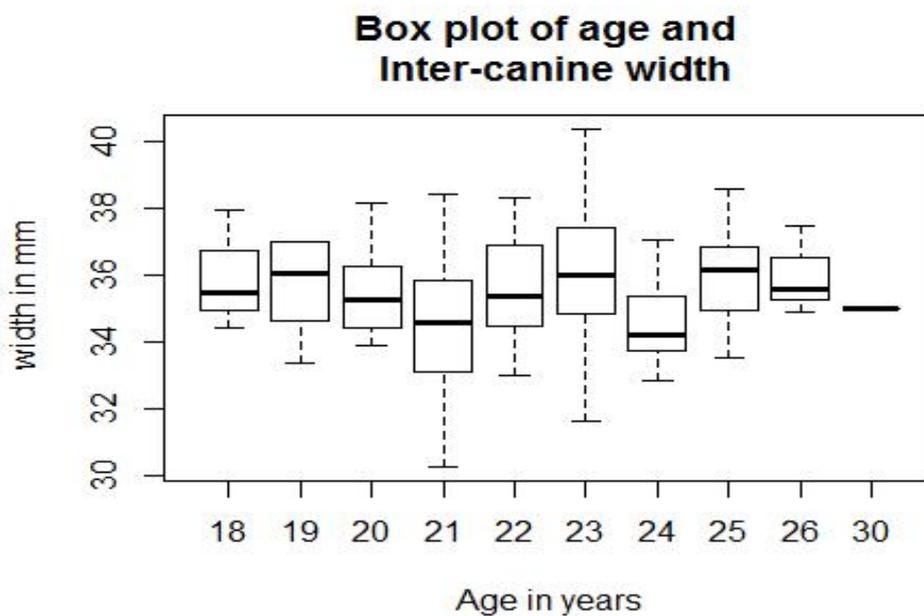


Figure 2
Box plot of the inner-canine width versus the ages of the participants



The mean inter-canine width for males was 35.86 ± 1.59 mm while that for the females was 34.98 ± 1.91 mm. The inter-canine width was significantly higher among males than the females ($p=0.008$). The mean distance from the posterior margin of the incisive papilla to the inter-canine line was 4.73 ± 1.73 mm. There was a very weak correlation between age and the distance from the posterior margin of the incisive papilla to the inter-canine line ($p=0.15$). The mean distance from the posterior margin of the incisive papilla to the inter-canine line among male participants was 4.75 ± 1.93 mm while that for the female participants was 4.71 ± 1.49 mm. There was no variation of the relationship between the inter-canine line and the posterior margin of the incisive papilla with gender ($p=0.89$).

DISCUSSION

Complete denture aesthetics is key for patient satisfaction with complete denture treatment outcome^{5,6-9}. Use of biometric guides in determining positions of denture teeth may contribute to a satisfactory treatment outcome. Studies conducted among other racial groups may not be a good guide to be applied clinically while using the incisive papilla to position the teeth among Kenyans of African descent. This could be the first study that provides information on the relationship between the posterior margin of the incisive papilla and maxillary canines and central incisors among Kenyans of African descent.

While the present study yielded the mean inter-canine distance to have been 35.44 ± 1.79 mm; studies among Caucasian populations have scored means of 34.3 mm¹⁰, 34.66 mm¹¹, and 34.48 mm¹². A Chinese study found a mean of 35.74 ± 2.17 mm¹³. The findings of this study were, therefore, in agreement with these earlier studies among Mongoloid and Caucasian populations. The inter-canine width among Kenyans of African descent

may, therefore, not differ from that among the Mongoloids and Caucasians. The participants in this study were of the same age bracket as the subjects in these earlier studies. The male participants in this study had a significantly greater inter-canine distance than the females ($p=0.008$). This finding was similar to an earlier study in a Mongoloid population¹⁴. Although the male participants in this study were slightly older than the female participants ($p=0.03$), the slight difference in age may not explain the difference. The results of this study may, therefore, mean that males in the study population have wider dental arches than the females.

The mean distance from the posterior margin of the incisive papilla to the inter-canine line in the present study was 4.73 ± 1.73 mm. Watt (1970) observes that in dentate mouths the inter-canine line passes through the middle of the incisive papilla in the coronal plane. After tooth loss, it was recommended that the canine tips be positioned in a coronal plane passing through the posterior border of the incisive papilla¹⁵. Notably, this recommendation contradicts the findings of the present study ($p<0.001$). However, the present findings are based on dentate participants and, therefore, the difference may be slightly reduced after compensating for resorption in edentulous persons. It is difficult to compare the findings of the present study with those of Lassila et al. (2001) who found that the inter-canine line passed very near the posterior region margin of the incisive papilla yet failed to report the exact distance¹⁶.

The mean distance from the posterior margin of the incisive papilla to the most labial aspect of the maxillary central incisor in this study was 14.93 ± 1.52 mm. Similar studies among Caucasians found this distance to have been 12.31 mm¹¹, $12-13$ mm¹⁷, 12.08 ± 1.18 mm¹⁶, and 12.3 ± 1.2 mm¹⁸. These figures are significantly different from the findings of the present

study ($p < 0.001$). Ortman and Tsao (1979) examined the same relationship, but did not state the age, race and gender of the participants, and found it to have been 12.454 ± 3.867 mm¹⁹. This finding was also statistically different from the findings of the present study ($p < 0.001$). Sawiris (1977) recommended that the central incisors be set with the labial surfaces 10mm from the posterior edge of the incisive papilla¹². This recommendation contradicts the findings of the present study.

Based on the findings of the current study, it may be appropriate to consider setting the maxillary central incisors slightly more than 12mm from the posterior limit of the papilla. This may be used as a starting point when contouring occlusal rims and while assessing the positions of maxillary central incisors in complete dentures among Kenyans of African descent. However, the ultimate position of the maxillary central incisor must take into account alveolar resorption, aesthetics, incisal relationship of the opposing arch and patient desires. Acceptance of the wax complete denture by the patient at trial stage is also key in acceptance of the final denture.

Despite the wide age variation among the participants in the Caucasian studies (17-62 years), the findings of the studies were not different. This is consistent with findings of the current study that the distance from the posterior margin of the incisive papilla to the most labial point of the maxillary central incisor does not vary with age.

In conclusion, this study describes the relationship between the posterior limit of the incisive papilla and maxillary central incisor and canine among Kenyans of African descent. It brings out salient unique features of this relationship among this people group. The placement of maxillary central incisors and canines among Kenyans of African descent during complete denture construction should incorporate the subtle

unique features of this population that have been shown in the present study.

ACKNOWLEDGEMENT

I appreciate the students who participated in this study. I am also grateful to Dr R.J Mutave for her immense contribution to the study.

DECLARATION OF CONFLICT OF INTEREST

The authors declare that there are no competing financial interests.

STUDY FUNDING

The study was funded by the principal investigator

REFERENCES

1. Smith, D.E. The reliability of pre-extraction records for complete dentures. *The Journal of Prosthetic Dentistry*, 1971; **25**: 592-608.
2. Silverman, M.M. Pre-extraction records to avoid premature aging of the denture patient. *The Journal of Prosthetic Dentistry*, 1955; **5**: 465-476.
3. Al Wazzan, K.A. The relationship between intercanthal dimension and the widths of maxillary anterior teeth. *The Journal of Prosthetic Dentistry*, 2001; **86**: 608-612.
4. Harper, R.N. The Incisive Papilla The Basis of a Technic to Reproduce the Positions of Key Teeth in Prosthodontia. *Journal of Dental Research*, 1948; **27**: 661-668.
5. Carlsson, G., A. Otterland, and A. Wennstro. Patient factors in appreciation of complete dentures. *The Journal of Prosthetic Dentistry*, 1967; **17**: 322-328.
6. Vallittu, P., A. Vallittu, and V. Lassila. Dental aesthetics-a survey of attitudes in different groups of patients. *Journal of Dentistry*, 1996; **24**: 335-338.
7. Brewer, A. Selection of denture teeth for esthetics and function. *The Journal of Prosthetic Dentistry*, 1970; **23**: 368-373.
8. Hirsch, B., B. Levin, and N. Tiber. Effects of patient involvement and esthetic preference on denture acceptance. *The Journal of Prosthetic Dentistry*, 1972; **28**: 127-132.

9. Lefer, L., M.A. Pleasure, and L. Rosenthal. A psychiatric approach to the denture patient. *Journal of Psychosomatic Research*, 1962; **6**: 199-207.
10. Mavroskoufis, F. and G. Ritchie. Nasal width and incisive papilla as guides for the selection and arrangement of maxillary anterior teeth. *The Journal of Prosthetic Dentistry*, 1981; **45**: 592-597.
11. Ehrlich, J. and E. Gazit. Relationship of the maxillary central incisors and canines to the incisive papilla. *Journal of Oral Rehabilitation*, 1975; **2**: 309-312.
12. Sawiris, M. The role of anthropometric measurements in the design of complete dentures. *Journal of Dentistry*, 1977; **5**: 141-148.
13. Keng, S. and K. Foong. Maxillary arch and central incisor dimensions of an ethnic Chinese population in relation to complete denture prosthodontics. *International Dental Journal*, 1996; **46**: 103-107.
14. Keng, S. Nasal width dimensions and anterior teeth in prosthodontics. *Annals of the Academy of Medicine, Singapore*, 1986; **15**: 311-314.
15. Watt, D. Biometric guides to the design of complete dentures. *Journal (Anglo-Continental Dental Society)*, 1970; **23**: 10.
16. Lassila, L., E. Klemetti, and V. Lassila. Position of the teeth on the edentulous atrophic maxilla. *Journal of Oral Rehabilitation*, 2001; **28**: 267-272.
17. Grave, A. and P. Becker. Evaluation of the incisive papilla as a guide to anterior tooth position. *The Journal of Prosthetic Dentistry*, 1987; **57**: 712-714.
18. Ellinger, C.W. Radiographic study of oral structures and their relation to anterior tooth position. *The Journal of Prosthetic Dentistry*, 1968; **19**: 36-45.
13. Ortman, H.R. and D.H. Tsao. Relationship of the incisive papilla to the maxillary central incisors. *The Journal of Prosthetic Dentistry*, 1979; **42**: 492-49